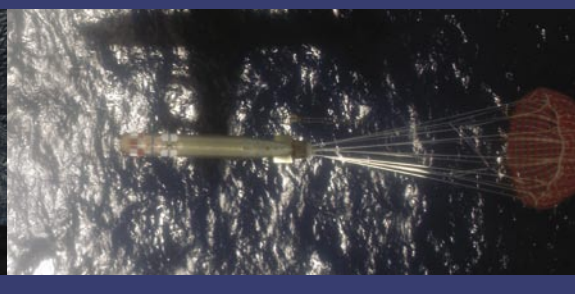




SEA SHIELD

PLATFORMS
AIRCRAFT

Broad Area Maritime Surveillance (BAMS) Unmanned Aircraft System (UAS)

Description

BAMS UAS is integral in recapitalizing the Navy's airborne ISR force. BAMS UAS will provide a persistent maritime ISR capability that will play a significant role in the Sea Shield and FORCEnet pillars of *Sea Power 21*. In its Sea Shield role, BAMS UAS's on-station persistence enables unmatched awareness of the maritime battlespace by sustaining the maritime Common Operational Picture for Surface Warfare and the Global War on Terrorism. The system will serve as a Fleet Response Plan enabler while acting as a trip wire for surge forces. In its FORCEnet role, it will support decision superiority precision and mobility while providing IP-based wideband transponder services that net the battlespace.

BAMS UAS is an endurance-class UAS that will operate from land-based sites around the world. Sites most likely will be located at current P-3 aircraft, or its planned successor, MMA, operating sites. Because BAMS UAS and the MMA/P-3 have related, complementary missions, co-location enhances manpower, training, and maintenance efficiencies. Systems of up to 5-6 air vehicles at each operating location provide persistence by being airborne 24 hours a day, 7 days a week out to on-station ranges of 2,000 nautical miles. Worldwide access is achieved by providing coverage over high-density sea-lanes, littorals, and areas of national interest from its operating locations.

Status

The BAMS UAS analysis of alternatives, operational requirements document, and initial CONOPS is complete. Milestone B is scheduled for the fourth quarter, FY 2007 and IOC is scheduled for FY 2013.

Developers

To be determined.

MH-60R/S Seahawk Multi-Mission Combat Helicopters

Description

The MH-60R and MH-60S multi-mission combat helicopters are the two pillars of the CNO's Naval Helicopter Concept of Operations (CONOPS) for the 21st Century. Under the Helicopter CONOPS, the Seahawk will deploy as companion squadrons embarked in the Navy's aircraft carriers, surface warships, and logistics ships. The MH-60R will provide surface and undersea warfare support to Sea Shield operations with a suite of sensors and weapons that include low frequency (dipping) sonar, electronic support measures, advanced Forward Looking Infrared, and precision air-to-surface missiles. The MH-60S will provide mine warfare support for Sea Shield and will partner with the MH-60R for surface warfare missions carrying the same Forward Looking Infrared air-to-ground sensors and weapons. The MH-60S will be reconfigurable to provide Combat Search and Rescue and Naval Special Warfare support to joint theater operations. Airborne mine countermeasures operations will be accomplished using advanced sensor and weapons packages to provide detection, localization, and neutralization to anti-access threats. The MH-60S will anchor the fleet logistics role in carrier strike group and expeditionary strike group operations. MH-60R/S platforms are produced with 85 percent common components (e.g., common cockpit and dynamic components) to simplify maintenance, logistics, and training.

Status

The MH-60R completed its Operational Evaluation in third quarter FY 2005. It is scheduled for a full-rate production decision in FY 2006. The Navy plans to acquire 254 MH-60Rs. The MH-60S was approved for full-rate production in August 2002 and is currently undergoing scheduled block upgrades for combat and airborne mine counter-measure missions. The Navy plans to acquire 271 MH-60Ss.

Developers

Lockheed Martin; Owego, New York
Sikorsky; Stratford, Connecticut

MQ-8B Fire Scout Vertical Takeoff and Landing Tactical UAV (VTUAV)

Description

Fire Scout VTUAV will provide multi-mission tactical UAS support to the Littoral Combat Ship (LCS). Fire Scout will support LCS core mission areas of Mine Interdiction Warfare (MIW), Antisubmarine Warfare (ASW), and Surface Warfare (SUW) with modular payloads as well as organic ISR, targeting, and communication-relay functions. The Fire Scout will employ the Tactical Control System (TCS) and the Tactical Common Data Link (TCDL) as the primary means for UAS command and control and

sensor payload dissemination. Fire Scout is a critical component of LCS off-board sensors.

Status
Fire Scout is currently in Engineering, Manufacturing, and Development (EMD) with developmental testing ongoing. Fire Scout is scheduled for IOC in FY 2008. Fire Scout has also been selected by the U.S. Army for its Future Combat Systems (FCS) Class IV Unmanned Aircraft System.

Developers
Northrop Grumman; San Diego, California
Schweizer Aircraft Corporation; Big Flats, New York

P-8A Multi-Mission Maritime Aircraft (MMA)

Description
The P-8A will replace the P-3C Orion aircraft, which has reached the end of its service life. The P-8A will feature a technologically agile, open architecture that enables integration of modern, capable sensors with robust communications. P-8A will tailor integration of its onboard mission suite with unmanned aerial vehicles and satellite-based systems and sensors to assure maritime access in support of the Sea Shield pillar of *Sea Power 21*. MMA will provide unparalleled persistent undersea warfare capability as well as significant anti-surface warfare and intelligence, surveillance, and reconnaissance (ISR) capability. MMA will leverage global logistics support infrastructure and established advanced training applications to provide both higher availability and improved warfighting readiness. Finally, MMA will implement a new Human Total Force Strategy that uses contractors to perform most of the maintenance functions presently performed by Sailors, thereby lowering operating and support costs below that of the legacy platform.

Status
The MMA program received a Milestone 0 decision in March 2000 and explored concepts for MMA with industry. Included in the concepts was the integration of UAVs to augment MMA capability. An Analysis of Alternatives (AoA) began in summer 2000 and leveraged previous analyses and the results of the industry studies. The AoA concluded that manned aircraft are an essential element of providing broad area maritime and littoral armed ISR, and that UAVs provided a transformational opportunity for obtaining additional capability for warfighters. In 2002, the Navy re-engaged industry in Component Advanced Development, refining concepts, matching architecture to fill the Navy vision and validating requirements. USD (AT&L) approved a revised acquisition strategy to focus MMA on P-3 replacement, not a P-3 Service Life Extension. The Operational Requirements Document/Concept Development Document was endorsed by the Navy staff and received the required certifications from the Joint staff in preparation for a 2004 Milestone B (entry into System Development and

Demonstration). That milestone was successfully passed in May 2004 and the Navy selected the McDonnell-Douglas Corporation, a wholly owned Subsidary of the Boeing Company, as the single system integrator in June 2004. The P-8A program completed a successful Preliminary Design Review in November 2005 and is currently working toward Critical Design Review planned for early 2007.

Developers
Boeing; Renton, Washington

P-3C Orion Modification, Improvement, and Sustainment

Description
The P-3C Orion provides effective undersea warfare, anti-surface warfare, and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) capabilities to naval and joint commanders, including support for carrier strike groups and expeditionary strike groups. The current force is 12 active and three reserve squadrons. There are also three Reserve Fleet Response Units (FRUs) co-located with the active squadrons at Jacksonville, Florida; Brunswick, Maine and Whidbey Island, Washington. The FRUs operate current Fleet equipment and are trained to provide augmenting crews to the active force. The Navy's P-3 roadmap focuses on three areas: Inventory sustainment, modernization, and re-capitalization by the Multi-Mission Maritime Aircraft (MMA) to provide a force optimized for regional and littoral crisis and conflict.

Specific program elements include:

Inventory Sustainment: A service life assessment program has been completed to determine what actions must be taken to safely extend the airframe service life. A program of Special Structural Inspections (SSIs), which will allow extension of P-3 service life, started in FY 2003. More comprehensive inspections and preemptive repairs are being performed under the Enhanced Special Structural Inspection (ESSI) program that started in FY 2004. The Special Structural Inspection-Kit (SSI-K) program that starts in FY 2005 is similar to ESSI but has expanded scope and includes use of new design/materials to increase fail-safe margins. These programs will allow sustainment of the P-3 fleet until the MMA starts replacing the P-3 in 2013.

Modernization: The Anti-Surface Warfare Improvement Program (AIP) provides enhanced sensor, C4ISR, and weapon capabilities. The program includes the incorporation of improved C4I systems, an advanced imaging radar, an infrared/electro-optic sensor, an improved Electronic Support Measures (ESM) system, improved weapons capability, and enhanced survivability measures. AIP aircraft will be equipped with the USQ-78B acoustic processor for improved littoral ASW effectiveness.

The P-3C Update III Block Modification Upgrade Program (BMUP) converts P-3C Update II and II.5 aircraft to the Update III system architecture. BMUP aircraft are also equipped with the USQ-78B.

Status
Fifty-five SSIs are complete and 15 ESSIs are complete. Sixty-four of 68 funded AIP aircraft have been delivered (one has been struck). Eight of 25 BMUP kits have been delivered.

Developers
Lockheed Martin; Marietta, Georgia
Lockheed Martin; Eagan, Minnesota
Lockheed Martin; Greenville, South Carolina
Lockheed Martin; Manassas, Virginia
L3Com; Greenville, Texas

S-3B Viking Sustainment Program

Description
The S-3B Viking provides multi-mission support to battle group and joint commanders as the carrier strike group's primary anti-surface warfare platform. In addition, it provides electronic surveillance and overland strike support and will remain the sole organic aerial refueling asset until the full integration of the F-18E/F Super Hornet.

Status
The S-3B Viking community was selected for retirement in October 2002, which will be coordinated with the fielding of the F/A-18E/F Super Hornet tanker capable aircraft through FY 2009. All current avionics/navigation/computer upgrade programs required to safely sustain the aircraft through its projected retirement schedule have been completed. The majority of Viking pilots and naval flight officers will transition to other naval aviation communities as an integral part of the S-3B Sundown Plan.

Developers
Lockheed Martin; Fort Worth, Texas

SUBMARINES

SSN 774 Virginia-Class Nuclear-Powered Attack Submarine

Description
The *Virginia* (SSN 774)-class submarine will provide advanced acoustic technology and will perform traditional open-ocean anti-submarine and anti-surface missions, yet is specifically designed for multi-mission littoral and regional operations. These advanced submarines will be fully configured to conduct mining and mine reconnaissance, Special Operations Forces insertion/ extraction, battle group support, intelligence-collection and surveillance missions, sea-control, and land attack. Furthermore,

the *Virginia* SSNs will be specifically configured to adapt easily to special missions and emerging requirements.

The 30-ship SSN 774 program is the first major program to implement acquisition reform initiatives fully. The tenets of the *Virginia*-class affordability are Integrated Product and Process Development (IPPD), modular construction, parts reduction, and aggressive insertion of advanced COTS technologies and an open-architecture computing environment. The IPPD concept teams the Navy, shipbuilders, designers, and vendors to assure the most efficient and effective design early in the design process. Modular construction allows construction, assembly, and testing of systems prior to installation in the ship's hull, thereby reducing costs, minimizing rework, and simplifying system integration. The ship's modular design will also facilitate technology insertion in both new-construction future ships and back-fit into existing ships, throughout their 30-year service lives.

Status

The first seven ships are being built under an innovative teaming arrangement between General Dynamics Electric Boat (EB) and Northrop Grumman Newport News (NGNN). Under the teaming arrangement, construction of the ships will be shared by ship section. NGNN is building the bow, stern, sail, and selected forward sections for each submarine. EB is building the hull sections, the engine room modules, and the command-and-control system operating spaces. EB will assemble and deliver the first, third, and fifth ships; NGNN, the second, fourth, and sixth. Construction of the USS *Virginia* (SSN 774) began in FY 1998, and the ship was commissioned in October 2004. The *Virginia* conducted her first operational mission in 2005, prior to her Post Shakedown Availability dry-docking, an unprecedented achievement. *Virginia's* ability to successfully complete this early deployment is a testament to the excellent design and construction effort put forth by both EB and NGSS. USS *Texas* (SSN 775) began construction in FY 1999. USS *Hawaii* (SSN 776) began construction in FY 2001. USS *North Carolina* (SSN 777) began construction in FY 2002. USS *New Hampshire* (SSN 778) began construction in FY 2003. USS *New Mexico* (SSN 779) began construction in FY 2004 and SSN 780 and SSN 781 began construction in FY 2005 and FY 2006, respectively. *Virginia*-class acquisition continues throughout the FYDP. The FY 2007 request included funds for the fourth of five submarines ordered under an innovative multi-year procurement contract that resulted in a cost savings of approximately $80 million per hull or $400 million throughout the course of the contract

Developers

General Dynamics Electric Boat; Groton, Connecticut
Northrop Grumman; Newport News, Virginia

SURFACE AND EXPEDITIONARY WARFARE SHIPS AND CRAFT

CG 47 Ticonderoga-Class Aegis Guided-Missile Cruiser Modernization

Description

The 22 *Ticonderoga* (CG 47)-class guided missile cruisers have a combat system centered on the Aegis Weapon System and the SPY-1 A/B multi-function, phased-array radar. *Ticonderoga*-class cruisers provide multi-mission offensive and defensive capabilities, and operate independently or as part of Carrier Strike Groups, Expeditionary Strike Groups, and Surface Action Groups for global concepts of operation. The *Ticonderoga*-class combat system includes the Standard Missile (SM-2), unparalleled land-attack systems, advanced anti-submarine and anti-surface warfare systems, embarked sea-control helicopters, and robust command-control-and-communications systems in a potent, multi-mission warship. In addition, these cruisers are equipped with the MK-41 Vertical Launching System (VLS), giving them a significant surface fire capability with the Tomahawk Land-Attack cruise Missile (TLAM) and, in the future, the Tactical Tomahawk (TACTOM).

Status

The 22 VLS-capable Aegis cruisers are planned for Cruiser Modernization beginning in FY 2008, and will receive upgrades in air dominance (cooperative engagement capability, SPY radar upgrades), maritime force protection (CIWS 1B, ESSM, Nulka, SPQ 9B), undersea warfare (SQQ 89A(V)15) and mission life extension (SmartShip, all-electric auxiliaries, weight, and moment). The cruisers are viable candidates for a ballistic missile defense role. The Cruiser Modernization warfighting improvements will extend the Aegis combat system's capabilities against projected threats well into the 21st Century and, with the DDG 51 destroyers, serve as the bridge to the surface combatant family of ships: DD(X), LCS, and CG(X).

Developers

General Dynamics Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey

CG(X) 21st Century Cruiser

Description

The Next-Generation Guided Missile Cruiser, CG(X), is envisioned as a highly capable surface combatant tailored for Air and Missile Defense and Joint Air Control Operations. CG(X) will provide maritime dominance, independent command and control, forward presence and operate as an integral component of joint and combined forces. The CG(X) design and development program features evolutionary acquisition and spiral development practices to incorporate advanced technologies and next generation

engineering systems. CG(X) will also replace the Ticonderoga (CG 47)-class ship at the end of its 35 year service life. Current Navy campaign and joint missile defense analysis has demonstrated a critical mission need for CG(X) late next decade.

Status
The Navy anticipates the ICD for Maritime Defense of the Joint Force to be through Joint Staff review and receive JROC approval in early 2006. The subsequent AoA will determine CG(X)'s best mix of capabilities and tradeoffs between hull form, interceptors, air and missile defense systems, sensors, other combat systems, employment and costs.

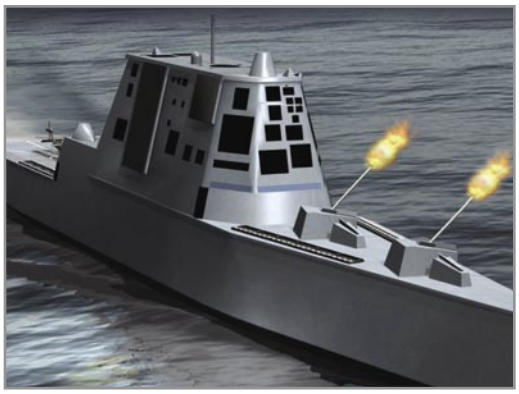
Developers
To be determined.

DDG 51 Arleigh Burke-Class Aegis Guided-Missile Destroyer

Description
The *Arleigh Burke* (DDG 51)-class guided missile destroyers are equipped with the Aegis Combat System which includes the SPY-1D multi-function, phased-array radar. The *Burke*-class combat system includes the MK-41 Vertical Launching System (VLS), an advanced Anti-Submarine Warfare (ASW) system, Standard Missile (SM-2), and Tomahawk land attack cruise missiles. Incorporating all-steel construction and gas-turbine propulsion, DDG 51 destroyers provide multi-mission offensive and defensive capabilities and can operate independently or as part of carrier strike groups, surface action groups, and expeditionary strike groups. The Flight IIA variants currently under construction incorporate facilities to support two embarked helicopters, significantly enhancing the ship's sea-control capabilities. These ships have the Aegis Weapons System Baseline 6 Phase 3 and Baseline 7, which incorporates Cooperative Engagement Capability (CE C) and Evolved Sea Sparrow Missile (ESSM) warfighting capabilities. The improved SPY-1D(V) radar and the Remote Mine-Hunting System(RMS) in DDGs 91-96 are just a few examples of capabilities being introduced as part of Baseline 7 Phase I, commencing with USS *Pinckney* (DDG 91). Together with the Cruiser Modernization program, these highly capable warships will be the bridge to the next-generation surface combatant family of ships: DD(X), LCS, and CG(X).

Status
Fifty-two *Arleigh Burke*-class destroyers have been delivered with a total of 62 to be delivered at the end of production. Two DDGs are scheduled for delivery in FY 2006. The purchase of the last three DDGs, to complete a ship class of 62, was completed in January 2005.

Developers
General Dynamics Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey



DD(X) 21st Century Destroyer

Description

The Navy has determined that multiple surface combatants are required to meet future warfighting requirements, not just a single ship class. DD(X) is the Navy's future multi-mission destroyer, designed to provide precision strike and sustained volume fires to support forces inland and conduct independent attacks against land targets. DD(X) will be armed with the Advanced Gun System (AGS), which fires precision-guided Long-Range Land-Attack Projectiles (LRLAP) up to 83 nautical miles. For longer-range strike missions, DD(X) will carry Tactical Tomahawks (TACTOM) housed in a damage-tolerant Peripheral Vertical Launch System (PVLS) lining the ship's hull. With state-of-the-art network-centric information technologies, DD(X) will operate seamlessly with naval, ground, and land-based forces. The DD(X) program's emphasis on "sensor-to-shooter" connectivity will provide a naval or Joint Task Force commander with the multi-mission flexibility to engage a wide variety of land targets while simultaneously defeating maritime threats. DD(X) capabilities in undersea, surface, and air warfare are designed for enhanced performance in the littoral environment, providing defense of other ships in the expeditionary strike group or carrier strike group. DD(X) will have a large hangar and flight deck that can support unmanned aerial vehicles as well as helicopters and the new MV-22 tiltrotor aircraft. DD(X) will utilize multi-spectral signature reduction to render it significantly less detectable to potential adversaries and more survivable than our legacy fleet.

DD(X) will feature an Integrated Power System (IPS) to provide power for advanced propulsion systems as well as high-powered combat systems and ship service loads. An open-architecture distributed combat system will support a "plug-and-fight" environment. Current elements of the DD(X) combat system include the modular and highly survivable PVLS, the AGS and the Dual Band Radar (DBR) suite, composed of the Multi-Function and Volume Search Radars. Other DD(X) features include an advanced hull form, optimal manning based on comprehensive human-systems integration and human-factors engineering studies, extensive automation, advanced apertures, and dramatic reductions across the entire spectrum of signatures (radar, acoustic, magnetic, and infrared). DD(X) will use a "spiral-design" review process, ensuring that each of these breakthrough technologies responds to future operational requirements. Once validated aboard DD(X), appropriate technologies will be incorporated into other members of the family of surface combatants, including the next-generation cruiser as well as future carriers and amphibious ships.

Status

DD(X) successfully completed Flag-level Critical Design Review (CDR) and all ten Engineering Development Models for new technologies have also passed CDR. The Navy proposed a Dual Lead Ship acquisition strategy allowing competing shipyards to build

lead ships simultaneously. The Navy has awarded bridge contracts to continue development of critical systems pending approval of the acquisition strategy.

Developers
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Raytheon; Sudbury, Massachusetts
More than 80 companies nationwide, including Lockheed Martin, BAE Systems, and General Dynamics Bath Iron Works

FFG 7 Oliver Hazard Perry-Class Guided-Missile Frigate Modernization

Description
The *Oliver Hazard Perry* (FFG 7)-class guided-missile frigates are capable of operating as an integral part of a carrier strike group or surface action group. They are primarily used today to conduct maritime interception operations, presence missions and counter-drug operations. A total of 55 *Perry*-class ships were built-51 for the U.S. Navy and four for the Royal Australian Navy. Of the 51 ships built for the United States, 21 remain in active commissioned service and nine are in the Navy Reserve Force (NRF). The FFG modernization improvements will assist the class in reaching its 30-year expected service life.

Status
The 30-ship FFG class is undergoing a modernization package that commenced in FY 2003 with USS *Kauffman* (FFG 59). It corrects the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The FFG 7 modernization package includes replacement of four obsolete Ship Service Diesel Generators (SSDG) with COTS SSDG; obsolete evaporators with COTS Reverse Osmosis (RO) units; and existing boat davit with COTS Slewing Arm Davit (SLAD). Other major HM&E alterations include ventilation modifications, AMR #3 AFFF Sprinkling modifications, Self-Contained Breathing Apparatus (SCBA) installation, replacement of water-cooled 400 Hz converters with air cooled frequency converters. Combat Systems improvements include the installation of CIWS 1B and Nulka, which will be completed earlier than scheduled (both are expected to be completed by FY 2007). The modernization effort is scheduled for completion by 2011.

Developers
General Dynamics Bath Iron Works; Bath, Maine

Littoral Combat Ship (LCS)

Description

Future joint and combined operations will hinge on our ability to provide access in the face of an unpredictable and asymmetrical threat. This has been recognized for some time; however, the events of the last few years, including the Global War on Terrorism, have brought a renewed sense of urgency to these misions. The anti-access threats challenging our naval forces in the littorals include quiet diesel submarines, mines, and small highly maneuverable surface attack craft. Such threats have great potential to be effectively employed by many less-capable countries and non-state actors to prevent U.S. forces from unhindered use of littoral areas. LCS, as one element of the future "surface combatant family of ships," will be optimized to defeat these anti-access threats in the littoral. It will use open-systems architecture design, modular weapons and sensor systems, and a variety of manned and unmanned vehicles to expand the battle space and project offensive power into the littoral.

Technology has matured to the point where we can employ significant warfighting capability from a small, focused-mission warship like the LCS in support of Sea Strike and Sea Shield operations. Focused-mission LCS mission packages are being developed that will provide capabilities critical to Sea Shield's forcible entry, sea/littoral superiority, and homeland defense missions. The ship will also possess inherent capabilities to conduct missions supporting intelligence, surveillance, reconnaissance, special operations, and maritime interception and homeland defense, regardless of mission package installed. Fully self-deployable and capable of sustained underway operations from homeports to any part of the world, the LCS will have the speed, endurance, and underway replenishment capabilities to transit and operate independently or with Carrier Strike or Expeditionary Strike Groups.

Status

LCS will capitalize on emerging unmanned vehicle, sensor and weapons technologies and will deliver the focused Sea Shield missions of Mine Warfare, Surface Warfare, and Anti Submarine Warfare. Initial program included 4 Flight 0 ships through FY 2007 with a notional Flight 1 to begin in FY 2008. Flight 0 has recently been expanded to include all ships through FY 2009. In May 2004, Navy awarded two contracts options to Lockheed Martin and General Dynamics to build four LCS Ships (2 of each design). USS *Freedom* (LCS 1), the first Lockheed Martin ship, is under construction in Marinette Marine (WI) with expected completion in February 2007. Final Design is complete for the General Dynamics ship (not yet named) and the option for detailed design and construction was exercised in October 2005 with construction underway at AUSTAL in Mobile Alabama. The Mine Warfare mission package will deliver in FY 2007 with Anti-submarine Warfare and Surface Warfare packages delivering in FY 2008.

Developers

Flight 0 teams led by General Dynamics and Lockheed Martin

MCM-1 Avenger-Class Mine Countermeasures Ship Modernization

Description

The *Avenger* (MCM-1)-class mine countermeasures ships are primarily used to detect, classify, neutralize, and sweep mines in integral waterways. These ships are one part of the mine warfare "triad". A total of 14 *Avenger*-class ships were built. Of the 14 ships built, nine remain in active service, and five are in the Naval Reserve Fleet (NRF). Upon d commissioning of the ten MHC-51 Osprey-class Coastal Mine Hunters, the five NRF ships will be placed back into active service. The MCM modernization improvements will assist the class in reaching its 30-year expected service life.

Status

The 14-ship MCM class is undergoing a modernization package that commenced in FY 2004. It corrects the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The MCM-1 modernization package includes Planned Product Improvement Program (PPIP) on the Isotta Fraschini main engines and generators for MCM-3 through MCM-14; replacement of the obsolete Mine Neutralization Vehicle with COTS Expendable Mine Neutralization System (EMNS); and upgrading the existing SQQ-32 Sonar with High Frequency Wide Band capabilities. Other major HM&E alterations include 400-Hz modifications, replacement of Aft Deck hydraulic equipment with electric equipment, replacement of the diesel generator analog voltage regulators with digital voltage regulators, and upgrading the common navigation system. The modernization effort is scheduled for completion by 2010.

Developers

To be determined.

WEAPONS

AIRBORNE

Airborne Mine Neutralization System (AMNS)

Description

The AMNS is an expendable, remotely operated mine neutralization device that leverages NDI and COTS technologies, deploys from MH-60S helicopters, and provides identification and neutralization of proud (i.e., not buried), close-tethered, and in-volume naval mines. The MH-60S will deploy a remotely operated AMNS neutralization device to a previously detected mine location where it will reacquire and neutralize identified targets. The AMNS will be fully integrated into the MH-60S avionics architecture.

Status
Beginning in FY 2003, AMNS systems have been procured for the MH-53E to provide a near-term fleet-interim airborne neutralization capability. Follow-on AMNS system integration into the MH-60S began in FY 2003 and will continue through a FY 2007 Milestone C decision. The Navy projects a FY 2009 IOC for the AMNS on the MH-60S.

Developers
Lockheed Martin; Syracuse, New York
STN Atlas; Germany

Rapid Airborne Mine Clearance System (RAMICS)

Description
The RAMICS will fire a special 30mm supercavitating projectile from a Bushmaster II gun to neutralize surface and near-surface mines. The RAMICS system will ultimately be hosted onboard the MH-60S helicopter as one of five developing Airborne MCM (AMCM) weapon systems organic to the Strike Group.

At the heart of this system is a supercavitating Tungsten projectile that is specially designed for traveling tactical distances in air and water and through a casing, causing a low-order deflagration of the mine. The gun is controlled by a fire-control system with targeting algorithms coupled with a Light Detection and Ranging (LIDAR) system. The LIDAR locates and targets the mines and provides aiming coordinates to the gun's fire control system to fire a burst of rounds at the mine, causing immediate and positive mine neutralization.

Status
The RAMICS program is re-baselined in FY 2006. Procurement of systems begins in FY 2009 with first installments in FY 2010. RAMICS IOC is scheduled for FY 2010.

Developers
Northrop Grumman; Melbourne, Florida

SUBSURFACE, SURFACE, AND EXPEDITIONARY

Assault Breaching Systems (ABS)

Description
The ABS program focuses on development of standoff weapons systems to counter mine and obstacle threats in the surf and beach zones. The program uses a "System of Systems" approach that includes development and fielding of Counter Mine Counter Obstacle (CMCO) kill mechanisms; Intelligence, Surveillance, Reconnaissance, and Targeting (ISR/T); Precision Craft Navigation; Lane Marking; and C4I capabilities. Near-term capability is scheduled to be fielded in FY 2007 with a far-term capability by FY 2016 (IOC). Potential platforms for employ-

ment of the breaching (kill) mechanisms may include naval strike aircraft and Air Force combat aircraft.

Status
The program is funded. Coastal Battlefield Reconnaissance and Analysis, the ABS ISR/T system, achieved Milestone B for its Block I capability in FY 2006. JDAM Assault Breaching System (JABS) will be introduced as initial CMCO capability in FY 2007.

Developers
Northrop Grumman

Aerial Targets

Description
The Navy Aerial Target Program assesses foreign threats, develops targets to represent the threats, and procures targets for fleet training and weapon system test and evaluation. The current inventory includes drones that represent the following types of threats: high-altitude supersonic diving missiles (AQM-37), aircraft (QF-4), subsonic sea-skimming anti-ship cruise missiles (BQM-34/74), and supersonic sea-skimming cruise missiles (GQM-163A, MA-31). New efforts within the program include the development and procurement of a next-generation Supersonic Sea-Skimming Target (SSST), the GQM-163 Coyote, designed to validate fleet readiness and weapon system effectiveness against a family of supersonic anti-ship cruise missiles. In addition, the Navy is conducting a pre-planned product improvement on the primary subsonic aerial target, the BQM-74E. The follow-on to the BQM-74E, the BQM-74F will be a faster, more maneuverable subsonic aerial target with increased range and endurance to challenge weapons systems and better train sailors.

Status
The GQM-163A developmental efforts were completed in May 2005 with first delivery of Low Rate Production assets occurring in the third quarter 2005. A total of 20 production assets are currently on contract with an additional award of 19 planned for FY 2006. The GQM-163A serves as a replacement for the Vandal (MQM-8G). Forty-one MA-31 SSST targets are also on contract. Currently, integration efforts with F-16 and MA-31 are on-going and will be completed in the second quarter FY 2006. MA-31 targets will provide the Navy with a power dive capability. BQM-74F targets are planned to enter the fleet in FY 2008. The Navy is also incorporating autonomous pre-planned flight profiles for the BQM-74, which would reduce the need for target control stations and enable the target to fly in areas where target control is not available. The Navy has discontinued its QF-4 program and now conducts test and evaluation events with Navy crews on Air Force ranges against QF-4s procured from the Air Force. Also, the Navy and Air Force are in the early stages of forming a team to develop a follow on full scale target to replace the aged QF-4. The Navy is initiating pre-acquisition activities for the Threat D Program in

FY 2006 with a planned contract award in first quarter FY 2007. Threat D target program will represent a two-stage (subsonic to supersonic) threat and will be used to support operational testing of several Navy programs including Standard Missile (SM-6), Aegis, SSDS, and other systems.

Developers
BQM-74 E/F: Northrop Grumman; Rancho Bernardo, California
GQM-163A: Orbital Sciences; Chandler, Arizona
MA-31: Boeing; St. Louis, Missouri

Lightweight Hybrid Torpedo (LHT)

Description
The MK-54 LHT is a modular upgrade to the lightweight torpedo inventory and is designed to counter quiet diesel-electric submarines operating in the shallow water littoral environment. LHT combines existing torpedo hardware and software from the MK-46, MK-50, and MK-48 Advanced Capability (ADCAP) programs with advanced digital COTS electronics. The resulting MK-54 LHT offers significantly improved shallow water counter-countermeasures capability at reduced life-cycle costs. While the baseline MK-54 will provide the warfighter with improved shallow water performance, the MK-54 P3I program will modernize the MK-54 by taking continuous advantage of technology advancements during the hardware acquisition process while addressing current weapon limitations and evolving threats and countermeasures. The MK-54 modernization plan will leverage the spiral acquisition process to synergistically introduce new hardware and software updates that will provide step-like increases in probability of kill while reducing life-cycle cost and allowing the torpedo to remain ahead of the evolving littoral submarine threat.

Status
MS II was achieved in FY 1996 along with an EMD contract award. A successful CDR was held in November 1999 with developmental testing beginning in July 1999. The LRIP contract was awarded in early FY 2000. The MK-54 Program completed OPEVAL in third quarter FY 2004, and achieved IOC in fourth quarter FY 2004. Procurement will include 128 LHTs in FY 2006, and approximately 1,500 for the total program. The torpedoes will be procured in economic order quantities from FY 2007 through FY 2011 to achieve a full operational capability in FY 2011.

Developers
Raytheon; Mukilteo, Washington

MK-15 Phalanx Close-In Weapon System (CIWS)

Description

The MK-15 CIWS is a radar-controlled, rapid-fire gun capable of firing 4,500 rounds per minute. An integral element of ship self-defense and the anti-air warfare, defense-in-depth concept, CIWS provides terminal defense against Anti-Ship Cruise Missiles (ASCMs) and high-speed aircraft penetrating outer fleet defensive envelopes. Additionally, CIWS Block 1B Surface Mode provides defense against small, fast, surface craft and slow-flying helicopters and aircraft. Other Block 1B improvements include better sensor support for close-in engagements [Forward Looking Infra Red/Video Tracker/Enhanced Radar (Ku Band)], the Enhanced Lethality Cartridge, and Optimized Gun Barrels. Existing CIWS mounts (Block 1 Baseline 0 through 2 and Block 1A) are being upgraded to CIWS Block 1B, outfitting all deploying ships by FY 2010 and completing installation by FY 2012. CIWS 1B upgrades and new production are programmed for aircraft carriers, cruisers, destroyers, frigates, and amphibious warships (LHD, LHA, and LPD) classes.

Status

More than 400 CIWS systems have been deployed at sea on U.S. warships since the system was first tested in August 1973. Development and Operational Testing of the fire-control system was completed in FY 1996, using the Self-Defense Test Ship. Testing of the Phalanx Surface Mode capability was completed in FY 1998, again using the Self-Defense Test Ship, and initial delivery was made in FY 2000. Acquisition continues in sufficient numbers to support new-construction warship delivery. In FY 2005 22 CIWS 1Bs were procured with 169 scheduled across the FYDP (FY 2006-2011).

Developers

Raytheon; Tucson, Arizona

MK-48 Advanced Capability (ADCAP) Torpedo

Description

MK-48 heavyweight torpedoes are used solely by submarines and are employed as the primary ASW and ASUW weapon in attack submarines and as the principal defensive weapon in strategic ballistic-missile submarines. Additionally, three allied countries have acquired the MK-48 torpedo. With a need to continue torpedo performance-upgrade programs to counter continuously evolving threats, the Navy developed the MK-48 ADCAP torpedo.

MK-48 ADCAP: The MK-48 Mod 5 ADCAP torpedo is the replacement for the MK-48 Mod 4 torpedo. Authorized for full production in 1990, the ADCAP counters surface-ship and submarine threats with greater speed and accuracy than any other submarine launched torpedo in the Navy's history. It is a heavyweight acoustic-homing torpedo with sophisticated sonar, all-digital guidance and control systems, digital fusing systems, and propul-

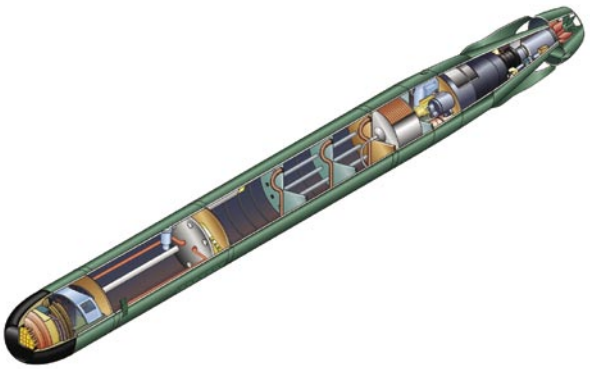
sion improvements. Its digital-guidance system allows for repeated improvements to counter evolving threats through software upgrades. The last new ADCAP torpedo was delivered in 1996. To improve future performance, several upgrades are being made to the existing ADCAP inventory.

ADCAP Modification Program (MODS): The MODS program implements significant software and hardware improvements to the existing ADCAP inventory to improve ADCAP operational capability in the next torpedo generation.

MK-48 Mod 6 ADCAP: The MK 48 Mod 6 gains two significant improvents over the Mod 5 following MODS program upgrade, one in guidance and control (G&C Mod), and the other in the torpedo propulsion unit (TPU Mod). The G&C Mod improves the acoustic receiver, replaces the guidance-and control set with updated technology, increases memory, and improves processor throughput to handle the expanded software demands required to improve torpedo performance against evolving threats. The TPU Mod provides a tactically significant reduction in torpedo radiated-noise signatures.

MK 48 Mod 7 Common Broadband Advanced Sonar System (CBASS): CBASS is a significant hardware and software upgrade to the MK-48 Mod 6 torpedo. The CBASS program is a joint development program with the Royal Australian Navy. It will include a new broadband sonar system (and its associated software) to achieve significant increases in operating bandwidth. The system will also include new broadband processing algorithms that will improve CCM and shallow-water performance while retaining deep-water performance characteristics. With the standup of a Royal Australian Navy MK-48 ADCAP intermediate maintenance capability in Australia, both Navies will be ready for joint operational testing to be conducted in waters off Australia. The first CBASS in water runs were conducted in September 2004 and the MK-48 Mod 7 CBASS torpedo is on schedule for IOC in FY 2006. The MK-48 ADCAP is and will remain the Navy's primary submarine launched conventional Anti-Submarine Warfare and Anti-Surface Warfare torpedo through 2026.

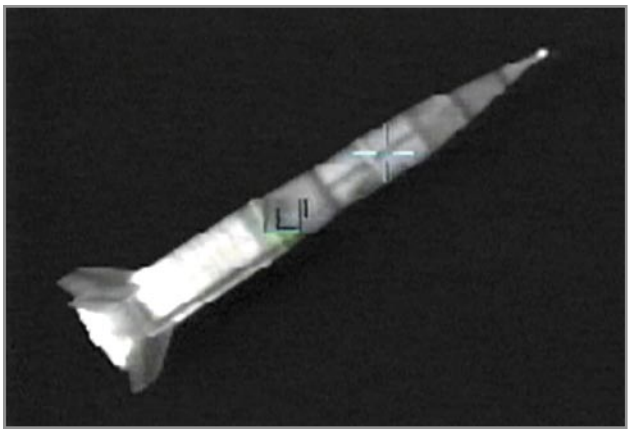
Operational Software Upgrades: Software upgrades have been and will be developed and integrated into the MK-48 ADCAP. Changes in threat scenarios, such as the inclusion of littoral operating areas, the increased availability of modern countermeasures, and the proliferation of diesel submarines, are the major impetus for updating software. Performance issues, including deficiencies discovered during fleet exercises and developmental testing, also will be resolved during these updates. The MK-48 ADCAP Torpedo Spiral Development program involves improving torpedo performance through software upgrades primarily against the shallow water diesel threat. Spiral 1 is expected to provide a 25 percent increase in torpedo effectiveness against targets in shallow water.



Status
The first phase of Spiral 1 has been completed and released for fleet use. Full Spiral 1 developmental and operational testing (DT/OT) will be completed in FY 2006. Spiral 2 and 3 development is in progress with DT/OT expected in FY 2008. Spiral 4 is planned for FY 2010. The MK-48 ADCAP Mod 6 ACOT completed DT in November 2004 and completed OT in November 2005 with fleet release expected in 2006. The MK-48 ADCAP Mod 7 (CBASS) is in OT with IOC scheduled for FY 2006. A total of 1,263 units are slated for conversion through the life of the program.

Developers
Raytheon; Keyport, Washington

Navy Ballistic Missile Defense (BMD)



Description
Aegis BMD includes modifications to the Aegis Weapon System and the development and upgrade of the Standard Missile 3 (SM-3) with its hit-to-kill kinetic warhead. This combination gives select Aegis cruisers and destroyers the capability to intercept short and medium-range ballistic missiles in the ascent, midcourse, and descent phases of their exo-atmospheric trajectories. Additionally, Aegis BMD provides surveillance and tracking capability against long-range ballistic missiles. Together, these capabilities provide robust defense-in-depth to U.S. and allied forces, vital political and military assets, population centers, and large geographic regions against the threat of ballistic missile attack. The Missile Defense Agency and the Navy fielded the Aegis BMD long-range surveillance and tracking capability as an element of the Ballistic Missile Defense System (BMDS) in October 2004. A short and medium range ballistic missile emergency engagement capability was fielded in 2005. The Aegis BMD Program Office continues a two-pronged engineering development effort of supporting SM-3 test flights and participating in risk-reduction activities.

Status
In October 2004 USS *Curtis Wilbur* (DDG 54) successfully conducted the initial at-sea shakedown of the Aegis BMD Long Range Surveillance and Tracking (LRS&T) capability, with outstanding results. Today, ten destroyers have the LRS&T capability, and are able to cue the greater BMDS. Additionally, two Aegis cruisers have both the LRS&T and an engagement capability. These ships are available to conduct emergency active defense against short and medium-range ballistic missiles and to cue the BMDS in defense of the homeland. A third cruiser is planned to have this capability in early CY 2006. The Navy and the Aegis BMD Program Office continue to develop the sea-based engagement capability. In February 2005, an SM-3 fired from the USS *Lake Erie* (CG 70) successfully intercepted a unitary (non-separating) ballistic missile target outside the earth's atmosphere. In November 2005, Lake Erie conducted the first successful intercept of a separating target. These were the fifth and sixth successful intercepts since January 2002. In

addition to successful engagement operations, Aegis BMD ships completed the first ever tracking of a live-ICBM class target by an LRS&T DDG in 2005. By demonstrating the ability to track long-range ballistic missiles, and with aggressive plans in place to continue demonstration of a sea-based engagement capability, the Aegis fleet has paved the way for the Navy to play a significant role in the nation's BMDS. By late 2005, Navy and MDA made significant progress in cooperative efforts to transition the ABMD Block 04 capability to the Navy and to merge future plans for Open Architecture combat systems. In addition to planning for a long-term solution to Sea Based Terminal BMD, Navy continues to plan for execution of the Near Term Sea Based Terminal (NTSBT) demonstration, an engagement of a Short Range Ballistic Missile (SRBM) using a modified Linebacker computer program and a modified SM-2 Block IV missile, in mid-CY 2006.

Developers
Lockheed Martin; Moorestown, New Jeresey
Raytheon; Tucson, Arizona

Naval Mines Quickstrike Mines

Description
The current Quickstrike family of aircraft-delivered bottom mines is being enhanced significantly by procurement of the programmable Target Detection Device (TDD) MK-71. Engineering development efforts include new advanced algorithms for ship detection, classification, and localization against likely threats, including quiet diesel-electric submarines, mini-subs, fast patrol boats, and air-cushioned vehicles

Status
Limited in-service support continues for current inventories and funding is in place for algorithm development and procurement of the TDD MK-71.

Developers
SECHAN Electronics, Inc.; Lititz, Pennsylvania

RIM-7, RIM-162 NATO Sea Sparrow Missile System (NSSMS) and RIM-162 Evolved Sea Sparrow Missile (ESSM)

Description
The MK-57 NSSMS is deployed on more than 50 Navy ships (CVN, LHD, LHA, DD, AOE classes) and numerous NATO ships as their primary surface-to-air ship self-defense missile system. Modifications to the Sea Sparrow continue, including the re-architecture combat system upgrade for CVNs, which reduces maintenance and manpower requirements, increases firepower, integrates the ESSM, and reduces cost of ownership through the use of COTS components. ESSM is the next generation of Sea Sparrow missiles, selected for the *Arleigh Burke* (DDG 51) Flight IIA Aegis destroyer self-defense systems as well as for Aegis cruisers receiving

Cruiser Modernization and aircraft carriers. ESSM is a kinematic upgrade to the improved RIM-7P missile. The upgrades consist of a more powerful rocket motor, a tail control section for increased responsiveness, VLS capability, upgraded warhead, and a quick-strike electronic upgrade. Enhanced ESSM kinematics and warhead lethality will leverage the robust RIM-7P guidance capability to provide increased operational effectiveness against high-speed maneuvering anti-ship cruise missiles at greater intercept ranges than is now possible with the RIM-7P. ESSM will be incorporated into the Aegis Baseline 6 Phase III and Baseline 7 Weapon Systems for short to medium-range missile defense. Additionally, the MK-29 trainable guided missile launcher will be modified to fire ESSM on CVNs. ESSM development is being pursued as an international cooperative initiative involving ten countries in the NATO Sea Sparrow Consortium.

Status

In-service support of NATO Sea Sparrow systems is complete. A memorandum of understanding was signed in June 1995 and 10 countries signed a production memorandum of understanding for ESSM in December 1997. ESSM successfully completed operational evaluation testing in mid-2003 and reached Milestone III and achieved full-rate production in January 2004. IOC occurred in FY 2004 with fleet introduction on an Arleigh Burke Flight IIA destroyer.

Developers

Raytheon; Tucson, Arizona

RIM-66C SM-2 Standard Missile-2 Blocks III/IIIA/IIIB

Description

Standard Missile-2 (SM-2) is the Navy's primary area air defense weapon. Deployed SM-2 Block III/IIIA/IIIB configurations are all-weather, ship-launched, medium-range surface-to-air missiles currently in service with the U.S. Navy and seven allies. SM-2 provides a robust area air defense layer required for maintaining forward naval presence, operating in the littorals, and projecting and sustaining U.S. forces in distant anti-access or area-denial environments. SM-2 Block III/IIIA/IIIB missiles are launched from the MK-41 Vertical Launching System (VLS) installed in Aegis cruisers (CG 52-73) and all Aegis guided-missile destroyers. It employs inertial mid-course guidance with command updates from the shipboard fire control system and an Electronic Countermeasure (ECM)-resistant mono pulse receiver for semi-active radar terminal homing. Each SM-2 block upgrade is progressively more capable and continues to evolve to provide enhancements in very high and very low altitude intercepts, stressing ECM environments, and against low altitude, supersonic maneuvering threats.

Block III features improved performance against low-altitude threats and optimizes the trajectory shaping resident within command guidance from the Aegis weapons system by implementing

Trajectory Shaping and Fuse Altimeter engineering change improvements. Block IIIA features significantly enhanced performance and lethality against sea-skimming threats due to a new directional warhead and Moving Target Indicator (MTI) fuse design in addition to enhanced trajectory-shaping functionality. Block IIIB builds on the Block IIIA improvements by adding an infrared (IR) guidance mode capability developed in the Missile Homing Improvement Program (MHIP) to improve performance in a stressing ECM environment. The IIIB MHIP dual-mode RF/IR guidance capability is being incorporated to counter a specific fielded and proliferating electronic warfare system in existing aircraft and cruise missile threats. Blocks IIIA/IIIB will be the heart of the SM-2 inventory for the next 15 years. The latest generation of Block IIIB missiles includes a maneuverability upgrade (SM-2 Block IIIB w/MU) to enhance IIIB performance against low-altitude, supersonic maneuvering threats.

Status

SM-2 Block III/IIIA/IIIB missiles are currently deployed. Block IIIB is the only variant in production for the U.S. Navy, although Block IIIA is still produced for Foreign Military Sales. Block IIIBs are being produced as new all-up rounds (AURs) and as upgrades from older Block III and IIIA missiles through the Service Life Extension Program (SLEP). FY 1995 was the first year of production for the SM-2 Block IIIB, which achieved IOC in FY 1997. The Block IIIB Maneuverability Upgrade went into production in FY 2004. The procurement objective is 1,500 Block IIIB AURs and 1,100 upgrades, scheduled to end in FY 2015.

Developers

Raytheon; Tucson, Arizona

RIM-116A Rolling Airframe Missile (RAM)

Description

RAM is a high-firepower, low-cost system designed to engage antiship cruise missiles (ASCMs) in the stressing electronic countermeasures (ECM) littoral conflict environment. RAM is a five-inch diameter surface-to-air missile with passive dual-mode radiofrequency/infrared (RF/IR) guidance and an active-optical proximity and contact fuse. RAM has minimal shipboard control systems and does not require shipboard information after launch. Effective against a wide spectrum of existing threats, the RAM Block 1 IR upgrade incorporates IR "all-the-way-homing" to improve performance against evolving passive and active ASCMs. Current plans are for RAM to continue evolving to keep pace with emerging threats.

Status

RAM is installed in *Tarawa* (LHA-1)-class amphibious assault ships; seven *Wasp* (LHD 1)-class amphibious assault ships; eight *Whidbey Island* (LSD 41)-class dock landing ships; four *Harpers Ferry* (LSD 49)-class dock landing ships, and seven aircraft

carriers; RAM is also planned for installation on all remaining aircraft carriers by FY 2007 as well as for all *San Antonio* (LPD 17)-class landing platform dock ships and flight 0 LCS. Block 0 missiles and launchers completed their final production run on schedule, and the missile has had successful intercepts in 177 of 186 production-acceptance and ship-qualification tests. The Block 1 missile has completed the most stressing OPEVAL ever attempted using the Self-Defense Test Ship-23 of 24 successful firings-and has completed Developmental/Operational Testing, with IOC in FY 2000. Block 1 is currently at full-rate production. So far the program has procured 90 missiles in FY 2002, 106 in FY 2003, 90 in FY 2004, 90 in FY 2005, and an additional 540 programmed from FY 2006-2011.

Developers
Raytheon; Tucson, Arizona
RAMSYS; Germany

SM-6 Extended-Range Active Missile (ERAM) Block I/II

Description
The Navy's next-generation Extended Range Anti-Air Warfare(ER AAW) interceptor, SM-6 is a transformational surface-to-air missile. With its active-seeker technology, SM-6 will meet the anticipated theater air and missile warfare threat well into the next decade, providing an essential element of the Navy's Sea Shield vision. Introduction of active-seeker technology to AAW in the Surface Navy reduces Aegis Weapon System reliance on illuminators and provides improved performance against stream raids and targets employing advanced characteristics (maneuverability, low radar cross section, kinematics, and advanced electronic countermeasure features). SM-6 is a critical pillar of the Navy's Integrated Fire Control-Counter Air (NIFC-CA) capability and will provide a significant contribution to the Joint Integrated Fire Control operational architecture. The evolutionary acquisition strategy will leverage alignment of technology paths among Naval Sea Systems Command (NAVSEA), Naval Air Systems Command (NAVAIR), and the Air Force across multiple missions and missile production lines to dramatically reduce technology development, recurring production, and life cycle costs. The SM-6 ERAM acquisition strategy is characterized as a low-risk development approach which leverages the SM-2 Block IV/IVA program Non-Developmental Items and Raytheon's Advanced Medium Range Air-to-Air Missile (AMRAAM) Phase 3 active seeker program for NAVAIR. The SM-6 need is documented in the Mission Needs Statement for Joint Theater Air and Missile Defense, Theater Air and Missile Defense Capstone Requirements Document (CRD), and in the Ship Class Anti-Air Warfare Self-Defense CRD. The specific requirements are documented in the Operational Requirements Document for Standard Missile-6 (SM-6) "TALON" ERAM, signed by the CNO on 1 May 2004. The SM-6 missile will be fielded on legacy DDG 51 and CG 47 class ships as well as the future CG(X) warship.

Status
Navy established the SM-6 ER AAW program in PB 2004, with an FY 2010 IOC. The Joint Requirements Oversight Council (JROC) approved the Operational Requirements Document 23 June 2004 following a Milestone B Defense Acquisition Board decision 15 June 2004 designating SM-6 an ACAT 1D program. SM-6 completed preliminary design review in FY 2005 and transitions to detailed designing FY 2006 well ahead of schedule. Spiral development for Block II will achieve full Joint Integrated Fire Control engagement operations and could include expanded capabilities to support sea-based terminal ballistic missile defense.

Developers
Raytheon; Tucson, Arizona

UGM-133A Trident II/D5
Submarine-Launched Ballistic Missile (SLBM)

Description
The Trident II/D5 is the sixth generation of the Navy's Fleet Ballistic Missile (FBM) program, which started in 1955. The D5 is a three-stage, solid propellant, inertial-guided submarine-launched ballistic missile (SLBM) with a range greater than 4,000 nautical miles and accuracy measured in hundreds of feet. The first eight *Ohio*-class submarines were configured to carry 24 Trident I/C4 missiles SLBMs. The ninth ship, the USS *Tennessee* (SSBN 734) and all later ships were armed with the Trident II/D5 missile system. Conversion of four of the C4 ships to carry the Trident II/D5 missile began in FY 2000 and will be completed in FY 2008. Trident missiles are capable of carrying W76 or W88 Multiple Independently Targeted Reentry Vehicles (MIRVs). In operation, Trident II/D5 missiles have been declared at eight MIRV warheads while Pacific Fleet Trident I/C4 missiles have been declared at six under the Strategic Arms Reduction Treaty (START). The Navy continues to address future deterrence requirements against weapons of mass destruction and disruption, and the Trident II/D5 will ensure that the United States has a modern, survivable strategic deterrent.

Status
FY 2007 funding will be dedicated to the D5 life extension program. Full missile procurement begins in FY 2008 ending in FY 2012 with a total acquisition of 108 additional missiles.

Developers
Lockheed Martin; Sunnyvale, California

Stabilized 25-mm Chain Gun

Description
This upgrades the current MK-38 25mm chain gun with stabilization, remote operation, fire control, and EO sensor. The program fills the surface self-defense capability gap for ships that

are not CIWS BLK 1B configured, and is designed to engage real-time asymmetric threats at close range to ships in port, at anchor, or while transiting choke points or operating in restricted waters. It provides the capability to bridge current and future targeting and weapons technology in a close range Force Protection environment.

Status
PB 2007 budget funds 139 stabilized mounts, which will be fielded on all ship classes to fill the gap until CIWS BLK 1B can be fully fielded. The FY 2004 contract was awarded in June 2004 and the first two systems were delivered in December 2004.

Developers
United Defense; Louisville, Kentucky
Rafael, Inc.; Haifa, Israel

SENSORS
AIRBORNE

AAR-47 Missile Approach Warning System (MAWS)

Description
The AAR-47 is a passive, MAWS consisting of four sensor assemblies housed in two or more sensor domes, a central processing unit, and a control indicator. Employed on helicopters and transport aircraft across U.S. Armed Services, the AAR-47 MAWS warns of threat missile approach by detecting radiation associated with the rocket motor and automatically initiates flare expenditure. The MAWS provides attacking missile declaration and sector direction finding and will be interfaced directly to the ALE-39/47 countermeasures dispenser. The AAR-47(V)2 upgrade, which is in full-rate production, will improve missile warning performance, add laser warning functionality, and reduce operations and support costs of existing AAR-47 systems. Without the AAR-47, helicopters and fixed-wing aircraft have no infrared missile detection capability.

Status
AAR-47(V)2 is currently in early, full-rate production. Work has begun on an advanced two-color IR Missile Warning Sensor and laser-based countermeasure, which were demonstrated by the Tactical Aircraft Directed Infra-Red Counter-Measure (TADIRCM) Advanced Technology Demonstration (ATD). This revolutionary technology will be fielded in a future version of AAR-47. The Navy plans to buy one AAR-47(V)2 for every new assault support aircraft in the FYDP (MV-22, UH-1Y, AH-1W, KC-130J, etc). The procurement objective for retrofit kits is 1,090.

Developers
Alliant Defense Electronic Systems; Clearwater, Florida

ALR-67(V)3 Advanced Special Receiver

Description
The ALR-67(V)3 is a Radar Warning Receiver (RWR) designed to meet Navy requirements through the year 2020. It will enable Navy F/A-18E/F aircraft to detect threat radar emissions, enhancing aircrew situational awareness and aircraft survivability.

Status
The ALR-67(V)3 program successfully completed EMD phase and operational testing in 1999 and is in full-rate production. Production quantities will eventually outfit all F/A-18E/F aircraft.

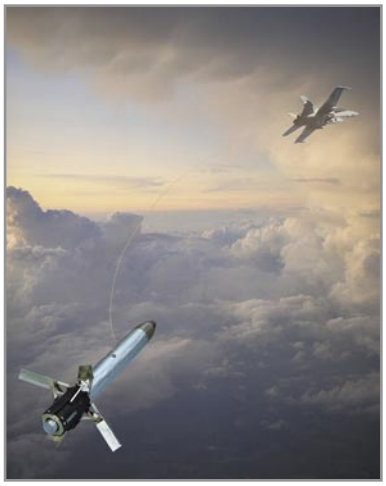
Developers
Raytheon; Goleta, California

ALQ-214 Integrated Defensive Electronic Counter-Measures (IDECM)

Description
Employed on the F/A-18E/F, the ALQ-214 IDECM is used to defend the host aircraft against radar-guided Surface-to-Air Missile (SAM) systems. Either through a towed decoy or several onboard transmitters, the ALQ-214 produces complex waveform radar jamming that defeats advanced SAM systems.

Status
The ALQ-214 and ALE-50 (towed decoy) combination are currently in full-rate production. The ALE-55 Fiber Optic Towed Decoy is currently in developmental test and is scheduled to begin operational test in FY 2006.

Developers
BAE Systems; Nashua, New Hampshire



Naval Aviation Improved Chemical, Biological, Radiological Nuclear Defense (CBRND)

Description
The Naval Aviation CBRND program is part of a joint-service effort to provide the warfighter with the means to sustain flight operations during the threat or use of Chemical and Biological (CB) weapons of mass destruction. Naval Aviation is the lead service for the Joint Protective Aircrew Ensemble (JPACE) chemical/biological protective flight suit, which provides percutaneous protection from CB warfare agents. Naval Aviation is also participating in the development of the Joint Service Aircrew Mask, which provides head-eye-respiratory CB protection. Furthermore, Naval Aviation is participating in several joint CBRND developmental and acquisition programs that will provide the capability for in-flight automated point and standoff detection of chemical agents, as well as fielding solutions and applicators to restore aviation assets by thorough decontamination of aircrew personnel, aircraft, and sensitive equipment.

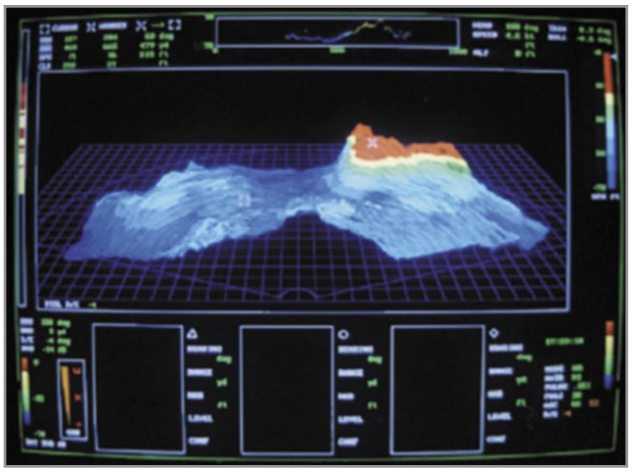
Status
JPACE Operational Test Readiness Review (OTRR), was completed in July 2005 with approval to proceed with the Navy portion of the operational testing. JPACE IOC is planned for first quarter FY 2008. The JSAM formal Request for Proposal (RFP) for the initial fixed-wing and helicopter variants was released in September 2005. Proposals are currently under review in Source Selection. JSAM IOC is planned for first quarter FY 2009.

Developers
Innovative Apparel (JPACE production); Belfast, Maine
Scott Aviation (JSAM development); Buffalo, New York

SUBSURFACE

BQQ-10 Acoustic Rapid COTS Insertion (ARCI)

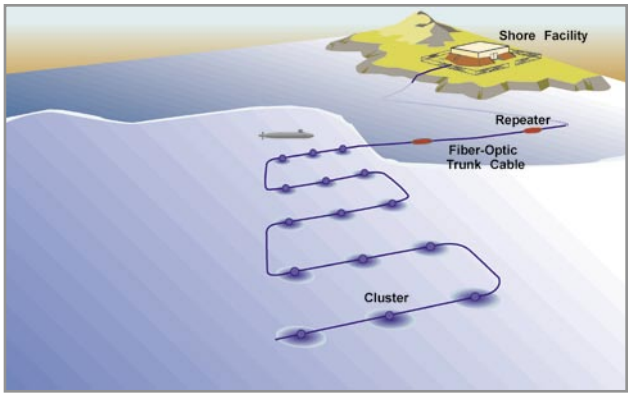
Description
ARCI Insertion is a three-phase program that replaces existing legacy submarine sonar systems, including BQQ-5 (SSN 688), BSY-1 (SSN 688I), BSY-2 (SSN 21), and BQQ-6 (SSBN 726) sonar, with a more capable and flexible COTS-based Open Systems Architecture (OSA), and provides the submarine force with a common sonar system. It allows development and use of complex algorithms that were previously well beyond the capability of legacy processors. The use of COTS/OSA technologies and systems will enable frequent periodic updates to both software and hardware with little or no impact on submarine scheduling. COTS-based processors allow computer power growth at a rate commensurate with commercial industry. A key facet of the sonar ARCI program (now designated BQQ-10) includes the Submarine Precision Underwater Mapping and Navigation (PUMA) upgrade. This consists of software processing improvements delivered as part of Advanced Processor Build (APB) 02, to the BQQ-10 High Frequency (HF, ARCI Phase IV) and BQS-15 EC-19/20 sonar systems. This enhancement provides submarines with the capability to map the ocean floor and register geographic features, including mine-like detections, and display the map in a 3-D representation. This capability to precisely map the ocean floor allows submarines to conduct covert battlespace preparation of the sea bottom as well as survey and avoid minefields with impunity. These digital maps can be compressed and transmitted to other naval forces for display on sea-based and land-based platforms. Additionally, the open architecture design of the ARCI system allows for the rapid inclusion of advances in sensor systems and processing techniques at minimal cost. New sensor systems, such as the low cost conformal array, large vertical array, and advanced towed arrays currently in development, will be incorporated in the ARCI system through annual advanced processor build (APB) software improvements.



Status
ARCI Phase II (FY 1999) provided substantial towed and hull array software and hardware processing upgrades that significantly improved LF detection capability. Phase III (FY 2001) augments the current Spherical Array DIMUS beam-former with a linear beam-former and enhanced processing that improves MF detection capability. Phase IV (FY 2001) upgrades the HF sonar on late-generation, improved *Los Angeles* (SSN 688I)-class submarines. Each phase installs improved processing and workstations (point click trackballs, Windows environment). Recent, real world encounters have consistently demonstrated overwhelming success of this program to restore U.S. acoustic superiority. ARCI completed OPEVAL in FY 2003. The BQQ-10 sonar system is being installed as rapidly as possible given the available funding. Additional funding will accelerate vital improvements to towed array processing in support of fleet operations, accelerated delivery of organic Mine Countermeasures capability inherent in ARCI Phase IV and PUMA, and completing Phase III upgrades for all submarines. Navy research, development, testing, and evaluation will continue to develop processing algorithms from the surveillance, tactical and advanced R&D communities as well as perform laboratory and at-sea testing, and distribute upgrades periodically.

Developers
Lockheed Martin; Manassas, Virginia
General Dynamics Advanced Information Systems; Fairfax, Virginia
Advanced Research Laboratory, University of Texas at Austin; Austin, Texas

Fixed Distributed System Commercial Off-The-Shelf (FDS-C)



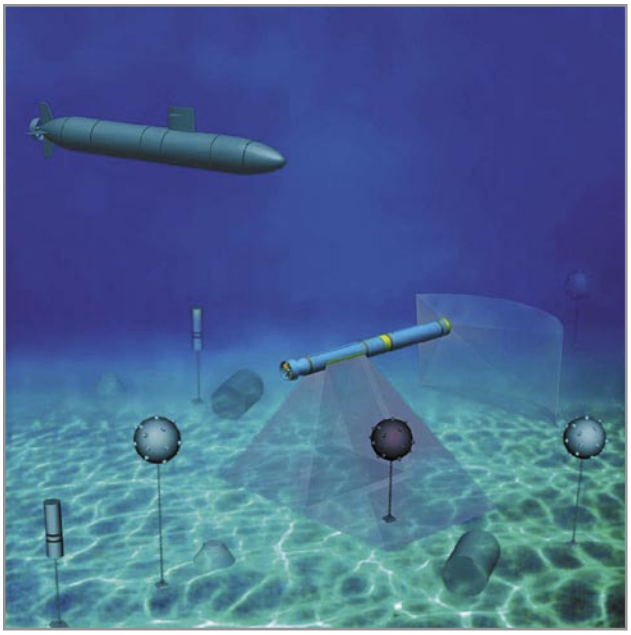
Description
FDS-C is a COTS version of the long-term, passive acoustic fixed surveillance FDS system. FDS-C provides threat location information to tactical forces and contributes to an accurate maritime picture for the Joint Force Commander. Due to its strategic positioning and long lifetime, it provides indication and warning of hostile maritime activity before conflicts begin.

Both FDS and FDS-C comprise a series of arrays deployed on the ocean floor in deep-ocean areas, across straits and other chokepoints, or in strategic shallow water littoral areas. The system is made up of two segments: the Shore Signal and Information Processing Segment (SSIPS), which handles the processing, display, and communication functions, and the Underwater Segment, which consists of a large area distributed field of acoustic arrays. FDS-C was developed as a less-expensive follow-on version of FDS by converting to COTS equipment. Taking advantage of advances made in the commercial industry provides a much more cost-effective FDS-caliber system to meet the fleet's ongoing needs for long-term undersea surveillance. Additionally, the program is pursuing the development of other technologies, such as an all-fiber-optic hydrophone passive array, to further increase system reliability and performance at reduced cost.

Status
FDS and FDS-C processing are being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in logistics support and software maintenance.

Developers
Tyco Integrated Cable Systems; Portsmouth, New Hampshire
Northrop Grumman Electronic Systems (Formerly Litton Guidance & Control Systems); Woodland Hills, California
MariPro; Santa Barbara, California

Unmanned Undersea Vehicles (UUV)



Description
Several acquisition programs are ongoing within the Navy to field UUV systems to improve current Navy Sea Shield capabilities in enabling assured access. The 2004 Navy UUV Master Plan prioritizes UUV missions to support *Sea Power 21*, and maps intended missions to four distinct vehicle classes (by size). The three highest priority UUV missions—ISR, MCM, and ASW—are the focus of current R&D efforts.

The Long-Term Mine Reconnaissance System (LMRS)—under development—will provide several technologies key to developing a capability to conduct clandestine minefield reconnaissance. In 2005, two LMRS vehicles proved clandestine launch and recovery, autonomous operation, and provided critical battery technology and integration development to enable up to 40 hours of endurance in the littorals.

The Mission Reconfigurable UUV (MRUUV) began development in FY 2005 and will provide a robust capability to conduct clandestine minefield reconnaissance and Intelligence, Surveillance, and Reconnaissance (electro-magnetic and electro-optical ISR, and Indications and Warning). The MRUUV will include unique capabilities, such as submarine launch and recovery and autonomous operation endurance of more than 40 hours. Sensor and system enhancements are being pursued to expand capabilities in the areas of Precision Underwater Mapping and Navigation, Synthetic Aperture Sonar, Acoustic Communications, and high-density renewable energy sources. The 21-inch MRUUV will be of similar size and shape as LMRS and will build upon the LMRS design by sharing certain components and support systems. MRUUV represents an enhanced capability by providing reconfigurable sensor packages for potential missions such as remote ASW tracking, undersea search and survey, communications and navigation aids and monitoring for weapons of mass destruction. A Large Displacement MRUUV will be developed as a follow-on to the 21-inch MRUUV and will bring enhancements in endurance and sensor packages.

The small UUV program is crucial to Explosive Ordnance Disposal (EOD) and the Expeditionary Mobile Diving and Salvage mission of enabling access to beaches, harbors, piers, and inland waterways. The small UUV will shorten timelines and increase safety for the clearance of mines and obstacles from these areas. Eventually, small UUVs will assume the roles of EOD divers and Marine Mammal Systems in the location and neutralization of mines. As no single small UUV is capable of addressing the needs of operational units and missions that they support, a system of systems acquisition approach is required.

Naval Special Clearance Team ONE (NSCT-1) UUVs support amphibious and mine warfare forces by deploying from small craft to enable rapid search, classification, mapping, reacquisition, identification, and neutralization tactical operations near hostile shores in the VSW zone between 10 and 40 feet of sea water.

EOD UUVs will be used to search for and localize unexploded ordnance hazards including mines, submerged munitions, and weapons of mass destruction. They will also conduct ship hull searches in support of Force Protection and other fleet support operations. Surface Mine Countermeasure (SMCM) UUVs will complement existing and future SMCM, reduce platform risk and improve the overall tactical timeline for MCM operations.

Status

Since inception, EOD and NSCT-1 UUV programs have been on accelerated schedules. NSCT-1 and EOD UUV interim systems have been fielded and engaged in real world operations. During Operation Iraqi Freedom, NSCT-1 UUVs were deployed in the port of Umm Qasr operating in strong currents and low visibility and validated their operational value to fleet operations. EOD UUVs were used to support Space Shuttle Columbia underwater search and recovery operations and, recently, hurricane Katrina recovery operations. The use of these UUVs reduced the tactical timeline, minimized risk to man-in-the-minefield systems and improved overall mission effectiveness.

The final NSCT-1 S-C-M UUV system prototype evaluation is complete and a production decision was reached in July 2005. IOC for the NSCT-1 S-C-M UUV system will occur in FY 2006. The NSCT-1 Reacquire and ID UUV program component will reach IOC in FY 2007, with the Neutralization UUV component reaching a production decision in FY 2010. The neutralization component will provide a low-cost mine neutralization capability to the fleet, NSCT-1, and EOD operators.

The LMRS completed detail design in August 1999 and is in the EMD Phase. Submarine launch and recovery test is scheduled for completion in February 2006. The 21-inch MRUUV ORD is under review at the joint staff level, with a Milestone B decision expected by June 2006. The SAHRV program recently completed operational evaluation. The FY 2007 request includes funding for development of 21-inch MRUUV and LDUUV.

Developers
LMRS: Boeing; Anaheim, California
SAHRV: Woods Hole Oceanographic Institution
NSCT-1:Bluefin Robotics and Hydroid
EOD: Lockheed Martin, Perry Technologies, Bluefin Robotics
SMCM: Hydroid

SUBSURFACE, SURFACE, AND EXPEDITIONARY

WLD-1 Remote Minehunting System (RMS)

Description
The WLD-1 RMS consists of an unmanned vehicle with an AQS-20A Sonar to conduct minehunting operations. The RMS can be launched from the DDG 51 class destroyer and will be incorporated in the design of LCS. RMS is designed to be launched with a pre-programmed search pattern and go over the horizon to search for mines using the AQS-20A Sonar. Once the mission is completed, RMS will return to the ship and data will be downloaded for Post-Mission Analysis (PMA).

Status
Milestone C and LRIP I occurred in FY 2005. IOC is scheduled in FY 2007. First deployment of RMS is scheduled to occur in FY 2007 on DDG 91 class destroyer and on LCS in FY 2010.

Developers
Lockheed Martin; Riviera Beach, Florida

SURFACE AND EXPEDITIONARY

Area Air Defense Commander (AADC)

Description
The AADC capability provides a maritime and shore-based operational-level planning and execution tool for air defense operations under the Joint Theater Air and Missile Defense (JTAMD) concept. In the early stage of a contingency, the preponderance of forces will likely be sea-based. Carrier Strike Groups will act as the hub of rapidly expanding joint force structure. A maritime-based or strategically-located ashore AADC Capability provides the tools necessary to plan and conduct operations in support of air defense throughout the spectrum of conflict. Current and future JTAMD operations require an advanced common Battle Management/Command, Control, Communications, Computers, Intelligence (BMC4I) architecture. This includes a Single Integrated Air Picture (SIAP) and the capability for centralized planning and decentralized execution. The AADC Capability will permit rapid re-planning and course of action evaluations. With the AADC capability, more of the Air Defense Planner's effort can be spent on analysis instead of data collection and input. The system employs a "six degrees of freedom" modeling capability to

optimize force laydown and employment to achieve the desired level of protection.

Situational awareness is provided by a 3-D tactical operations display system. The 3-D capability provides the ability to view the battlespace from any direction or altitude. This display capability provides a common picture through fusion of all available tactical data links and sensor information into an easily understood picture that enables the AADC to exercise command by exception. The AADC capability consists of a suite of high-performance computers and displays employing advanced software on a series of state-of-the-art processors. The AADC capability also provides a distributed, collaborative planning feature that permits the AADC staff to interact rapidly with counterparts in other staffs.

Status

There are six fielded, full suite units: Three maritime units are fielded onboard the USS *Shiloh* (CG 67), USS *Blue Ridge* (LCC-19), and USS *Mount Whitney* (LCC-20). One shore facility has been installed at the Joint National Integration Center (JNIC) at Schriever Air Force Base in Colorado. A second shore facility was installed in FY 2004 at the Joint Forces Command Joint Program Office (JFCOM JPO) program facility in Panama City, Florida. The third shore site is Tactical Training Group-Atlantic in Virginia Beach, Virginia. These shore sites will be used to analyze the capability's relevance to the Ballistic Missile Defense (at JNIC) and Air and Missile Defense (at JFCOM) and demonstrate the system's unique functionality to the joint community. Three deployable clients are also available to support additional capability testing either ashore or afloat.

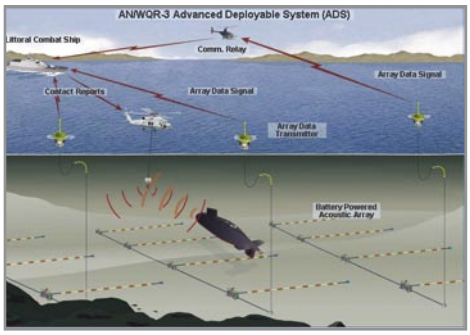
Developers

Johns Hopkins University Applied Physics Laboratory (Prototype); Laurel, Maryland
General Dynamics Advanced Information Systems (Production unit); Greensboro, North Carolina

Advanced Deployable System (ADS)

Description

ADS is a rapidly deployable passive acoustic undersea surveillance system designed to detect and track modern diesel-electric submarines and surface craft in littoral regions. At sea, demonstrations of ADS have validated the ability of the system to achieve its primary mission, as well as detect small fast boats, air cushion craft, and low-flying aircraft. ADS has potential detection capability against mine-laying operations and movement of vehicles ashore in the near-coastal zone. ADS employs distributed battery-powered acoustic arrays linked by small-diameter fiber optic cable over which hydrophone data is optically telemetered. The system is modular and configurable for specific missions and can be deployed from a number of different platforms. ADS is composed of: a Sensor Subsystem (SS) consisting of hydrophone arrays, cabling,



and pressure vessels containing supporting electronics and power; an Installation Subsystem (ISS) consisting of the equipment aboard the installation vessel that supports system deployment; a Tactical Interface Subsystem (TIS) that transmits array data to a receiver aboard the monitoring platform; and an Analysis and Reporting Subsystem consisting of data processors and displays.

ADS processing software leverages the Navy's Advanced Rapid COTS Insertion (ARCI) program and the mission planning software leverages the Navy Mine Warfare community's software planner, the Mine Warfare and Environmental Decision Aids Library (MEDAL).

Status
ADS is in the System Development and Demonstration Phase after a Milestone B decision in the first quarter of FY 2006. ADS is an Acquisition Category (ACAT) I C program. The program is structured to initially develop ADS as an off-board sensor system installed by the Littoral Combat Ship (LCS). Development of delivery from alternate platforms will begin in FY 2009.

Developers
Lockheed Martin Maritime Systems and Sensors;
Manassas, Virginia
Raytheon Integrated Defense Systems;
Portsmouth, Rhode Island
Ocean Power Technologies; Pennington, New Jersey
Harris Corporation; Melbourne, Florida
Orincon Defense; San Diego, California
Lockheed Martin, Perry Division; West Palm Beach, Florida

Airborne Laser Mine Detection System (ALMDS)

Description
The ALMDS is an organic, high-area coverage, electro-optic Airborne Mine Countermeasures (AMCM) laser system that detects, classifies, and localizes floating and near-surface moored sea mines. Deployed from the MH-60S helicopter, ALMDS will satisfy the Navy's need for a quick-response, wide-area, organic MCM reconnaissance system that can rapidly detect and classify mine-like contacts for subsequent prosecution. This capability will be critical in littoral zones, confined straits, choke points, and Amphibious Objective Areas. ALMDS offers a much greater area search rate than other types of AMCM equipment, and it represents a capability that does not exist in the current inventory.

Status
A competitive contract was awarded in April 2000 for development of an integrated ALMDS system for the MH-60S. Milestone C and LRIP I occurred in FY 2005. The IOC is scheduled for CY 2008.

Developers
Northrop Grumman; Melbourne, Florida

AQS-20A Mine-Hunting Sonar

Description

The AQS-20A is an underwater mine-detection sonar that also employs an Electro-Optic Identification (EOID) sensor capable of locating and identifying bottom, close-tethered, and moored sea mines. The AQS-20A mine-hunting system will be deployed and operated from the MH-60S helicopter as one of five organic Airborne Mine Countermeasures (AMCM) weapon systems resident in the carrier/expeditionary strike group onboard the Littoral Combat Ship (LCS). The AQS-20A system will also serve as the mine sensor subsystem of the Remote Mine Hunting System (RMS) hosted onboard Navy surface warships. The operational RMS system will be installed in the *Arleigh Burke* (DDG 51) Flight IIA Aegis guided missile destroyers beginning with DDG 91.

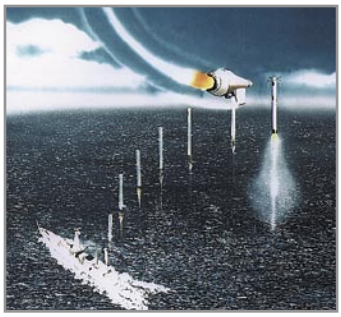
Status

Milestone C and LRIP I occurred in FY 2005. The IOC is scheduled for FY 2006. Improvements to Computer Aided Detection/Computer Aided Classification and Environmental Data Collection capabilities are being implemented via enhanced research and development efforts.

Developers

Raytheon; Portsmouth, Rhode Island

Nulka Radar Decoy System



Description

Nulka is an active, off-board, ship-launched decoy developed in cooperation with Australia to counter a wide spectrum of present and future radar-guided anti-ship cruise missiles. The Nulka decoy employs a broadband radio frequency repeater mounted atop a hovering rocket platform. After launch, the Nulka decoy radiates a large, ship-like radar cross-section flying a trajectory that seduces and decoys incoming ASCMs away from their intended targets. Australia developed the hovering rocket, launcher, and launcher interface unit. The U.S. Navy developed the electronic payload and fire control system. The existing MK-36 Decoy Launching System (DLS) has been modified to support Nulka decoys, resulting in the MK-53 DLS.

Status

Nulka received Milestone III approval for full-rate production in January 1999; installation began on U.S. and Australian warships in September 1999.

Developers

BAE Systems; Edinburgh, Australia
SECHAN Electronics; Lititz, Pennsylvania
Lockheed Martin Sippican; Marion, Massachusetts

Organic Airborne and Surface Influence Sweep (OASIS)

Description

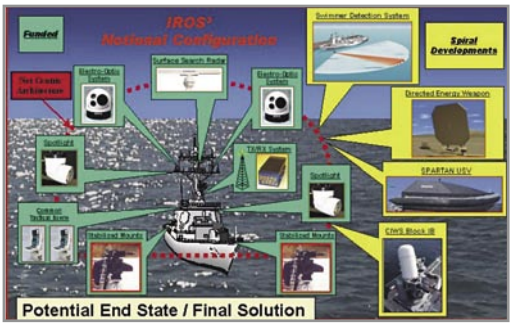
The OASIS system will provide the strike group with an organic, high-speed, magnetic/acoustic influence minesweeping capability to effectively neutralize sea mine threats in operating areas where mine hunting is not possible due to mine burial or high bottom clutter. The OASIS system is one of five under-development Airborne Mine Countermeasures (AMCM) weapon systems to be deployed and operated from the MH-60S helicopter (see MH-60S program summary).

Status

Milestone C and LRIP I are scheduled for FY 2007. IOC is scheduled for 2008.

Developers

EDO Corporation; New York, New York



Shipboard Protection System (SPS)

Description

SPS Increment I is designed to augment current Naval Force Protection Tactics and Doctrine by providing a means to detect, classify, and engage real-time surface threats at close-range to ships in port, at anchor, and while transiting choke points or operating in restricted waters. The system will provide 360-degree Situational Awareness (SA) and will employ COTS integration to support incremental modifications as needed to tailor the system to the mission. It will provide the capability to bridge current and future technology by integrating current Force Protection initiatives and combat system technologies while sustaining mission-capable combatant force levels. A prototype system installed in the USS *Ramage* (DDG 61) provided the functional demonstration of what will become the SPS Increment I. The demonstration system employed COTS-based products interfaced with the SPS-73 surface search radar and its key components included electro-optical/infra-red devices, an integrated surveillance system, spotlights, acoustic hailing devices, and remotely operated stabilized small arms mounts. The prototype system installed in *Ramage* gained valuable fleet feedback, lessons learned, and integrated logistics support information which helped define requirements for SPS Increment I.

Status

SPS was approved at Milestone B for system design and development in January 2005. The Capabilities Development Document was approved in January 2005. A competitive contract was awarded to the Northrop Grumman Electronic Systems (NGES) development team in August 2005.

Developers
Northrop Grumman Electronic Systems, Lead Integrator; Charlottesville, Virginia
Science Applications International Corp, Integration and Logistics; Bloomington, Indiana
Ocean Systems Engineering Corp., Software Engineering and Sensors; San Diego, California
General Dynamics Armament and Technical Products (ATP), Weapons Mount; Charlotte, North Carolina

Solid-State SPY Radar (SS-SPY)
Next-Generation Theater Air & Missile Defense, Multi-Function Advanced Active Phased-Array Radar

Description
The SS-SPY advanced radar system is being developed as the primary air and missile defense radar for the Navy's next-generation cruiser CG(X). It is a multi-function, active phased-array radar capable of search, detection, tracking of airborne and ballistic missile targets, and missile engagement support. The advanced functions of this radar include multi-mission performance in a stressing environment that will enable simultaneous defense from all Theater Air and Missile Defense (TAMD) threats. The multi-mission capability will be effective in both air dominance of the battle space (Area Air Warfare) and in defense against ballistic missiles.

Status
The SS-SPY Radar is being developed as a competitive program and the requirements definition began this year, along with several risk-reduction projects to mature technologies for this advanced radar. The design and development after competitor down-select will lead to EDM development, testing, and production to support the IOC for CG(X).

Developers
To be determined.

SPQ-9B Radar Anti-Ship Cruise Missile (ASCM) Radar Improvement Program

Description
The SPQ-9B is a slotted, phased-array, rotating radar that significantly improves the ability of ships to detect and track low-altitude Anti-Ship Cruise Missiles (ASCM) in a heavy clutter environment. Its high-resolution track-while-scan, X-band, pulse-Doppler radar enables detection and establishment of a firm track at ranges allowing the combat system to engage subsonic or supersonic sea-skimming missiles at the outer edge of a ship's engagement envelope. SPQ-9B integrates with SSDS MK-2 on aircraft carriers and amphibious assault ships. Together these systems improve those ships' ASCM defense capabilities to pace the evolving world-

wide threat. The SPQ-9B is also an integral part of the Cruiser Modernization program, providing an ASCM cue to the Aegis Combat System.

Status
The SPQ-9B is being fielded in conjunction with SSDS MK-2 and CG Modernization.

Developers
Northrop Grumman; Melville, New York

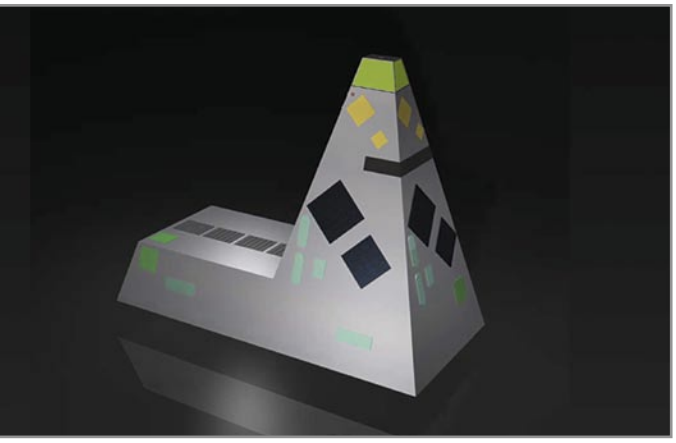
SPY-1 Aegis Multi-Function Phased-Array Radar

Description
The SPY-1 S-Band radar system is the primary air and surface radar for the Aegis Combat System installed in the *Ticonderoga* (CG 47) and *Arleigh Burke* (DDG 51)-class warships. It is a multi-function, passive phased-array radar capable of search, automatic detection, transition to track, tracking of air and surface targets, and missile engagement support. The fifth variant of this radar, SPY-1D(V), improves the radar's capability against low-altitude, reduced radar cross-section targets in heavy clutter environments, and in the presence of intense electronic countermeasures. The SPY-1 Series radars are also used to detect, track, and engage theater ballistic missiles on select Aegis Cruisers and Destroyers.

Status
The SPY-1D (V) littoral radar upgrade supersedes the SPY-1D in new-construction Flight IIA destroyers that began in FY 1998. Operational testing and evaluation was completed in the fall 2005. SPY-1D (V) is installed in DDGs 91 through 101 and programmed for installation in DDGs 102 through 112.

Developers
Lockheed Martin; Moorestown, New Jersey
Raytheon; Sudbury, Massachusetts

SPY-3 Multi-Function Radar (MFR)



Description
The SPY-3 MFR is an X-band active phased-array radar designed to meet all horizon search and fire control requirements for the 21st Century fleet. MFR is designed to detect the most advanced low-observable Anti-Ship Cruise Missile (ASCM) threats and support fire-control illumination requirements for the Evolved Sea Sparrow Missile (ESSM), the Standard Missile II (SM-2) and future missiles required to engage the most stressing ASCMs. The MFR also supports the new ship-design requirement for reduced radar cross-section, significantly reduced manning (no operators), and total ownership cost reduction. The MFR is planned for introduction in DD(X) and the next-generation CVN 21 aircraft carriers.

Status
Two Engineering and Manufacturing Development (EDM) radar arrays were built and tested at Wallops Island land-based testing facility. An Engineering Development Model will be tested at sea in FY 2006. Production of the MFR is planned to support equipment delivery schedules for DD(X) and CVN 21. The MFR will be fielded as integrated radar with the S-Band Volume Search Radar (VSR), together referred to as the Dual-Band Radar Suite (DBRS). Operational evaluation will occur with DD(X) testing. IOC for the DBRS is expected to be 2013.

Developers
Northrop Grumman Ship Systems (Prime);
Pascagoula, Mississippi
Raytheon Electronic Systems (Subcontractor);
Sudbury, Massachusetts

SQQ-89 Anti-Submarine Warfare (ASW) Combat System

Description
The SQQ-89 ASW combat system suite provides *Oliver Hazard Perry* (FFG 7), *Ticonderoga* (CG 47), and *Arleigh Burke* (DDG 51)-class surface warships with an integrated undersea warfare detection, classification, display, and targeting capability. The system combines and processes all sonar information, and processes and displays all SH-60B Light Airborne Multi-Purpose System (LAMPS) MK III sensor data. The current system comprises the following subsystems:

- **SQS-53C/D active/passive hull-mounted sonar (SQS-56 in FFGs)**
- **SQR-19 Tactical Towed Array System (TACTAS)**
- **MK-116 ASW fire control system**
- **SQQ-28 sonobuoy processor**
- **SRQ-4 SH-60B helicopter data link**
- **UYQ-25B Sonar In-situ Mode Assessment System (SIMAS)**
- **USQ-132 Tactical Display Support System (TDSS)**
- **SQQ-89(T) Onboard Trainer (OBT)**

The analog receivers of the SQS-53A/B hull-mounted sonar are being upgraded to digital receivers by the use of COTS processors, and are redesignated SQS-53D. Planned improvements to the SQQ-89(V) include:

- **MH-60R (LAMPS MK III) integration**
- **SRQ-4 Data Link Upgrade**
- **Multi-Function Towed Array (MFTA) that will provide low and mid-frequency bi/multi-static receiver capability between the SQS-53C, the MH-60R Airborne Low-Frequency Active Sonar (ALFS), and off-board systems**
- **Remote Mine-Hunting System (RMS) processing and display**

- **Echo Tracker Classifier (ETC) active classification capability**
- **SIMAS upgrade to updated performance prediction models**
- **Computer-Aided Dead-Reckoning Table (CADRT)**
- **Torpedo Recognition and Alertment Functional Segment (TRAFS)**

Status

New system acquisitions are for DDG 51 new-construction. Required modernization of existing systems for the shallow water littoral warfare environment is being accomplished by the use of COTS processors and displays. Starting in FY 2003, SQQ-89(V) 15+MFTA systems, designated SQQ-89A (V)15, were being procured for back-fit installations in CG 47 surface warships with DDG 51 warships beginning back-fit in FY 2008. The DDG 51 back-fit of SQQ-89(V) 15 was accelerated from FY 2009 to FY 2006. The first DDG 51 back-fit system will be purchased in FY 2006 and installed in FY 2008 with 22 follow-on units purchased across the FYDP. Seven DDG Scaled Improved Performance Sonar (SIPS) upgrades will begin back fit in FY 2006 with follow-on of 27 more units across the FYDP.

Developers

Lockheed Martin; Syracuse, New York
Advanced Acoustic Concepts; Hauppauge, New York

Ship-Self Defense System (SSDS)

Description

SSDS provides the integrated combat system for aircraft carriers and amphibious ships, enabling them to keep pace with the anti ship cruise missile (ASCM) threat. Moving toward an open-architecture distributed-processing system, SSDS integrates the detection and engagement elements of the combat system. With automated weapons control doctrine, Cooperative Engagement Capability (CEC), and enhanced battle space awareness, SSDS provides these ships with a robust self-defense capability in support of Sea Shield.

Status

SSDS was approved for full-rate production following operational testing in 1997. IOC occurred in 1997 with the deployment of SSDS MK-1 in the USS *Ashland* (LSD 48). SSDS MK-1 has subsequently been installed in all 12 *Whidbey Island* (LSD 41)-class ships. A more advanced version, SSDS MK-2, is being fielded in aircraft carriers, the *Wasp* (LHD 1) and *San Antonio* (LPD 17) ship classes. By the end of 2011, 21 ships will have received the SSDS MK-2 system, including the Self-Defense Test Ship.

Developers
Raytheon; San Diego, California
Technical support: Johns Hopkins University Applied Physics Laboratory; Laurel, Maryland
Naval Surface Warfare Centers; Port Hueneme, California
Naval Surface Warfare Centers;
Dahlgren and Dam Neck, Virginia

Surface Electronic Warfare Improvement Program (SEWIP) Block 1 Upgrade

Description
SEWIP is a spiral development block upgrade program for the SLQ-32 Electronic Warfare (EW) system, which is installed on all combatants and auxiliaries in the U.S. Navy, with total fleet wide population of 170 systems.

Block 1A replaces the processor with Electronic Surveillance Enhancement (ESE) and display console with UYQ-70. The ESE and UYQ-70 are integrated with Improved Control and Display (ICAD) software. Block 1A also improves Human Machine Interface of the SLQ-32.

Block 1B adds Specific Emitter Identification (SEI) capability which offers extremely accurate platform identification; it will be deployed initially as a stand-alone SSX-1 systems (Block 1B1) pending integration of SEI with other capabilities (Block 1B2). Block 1B3, High Gain High Sensitivity (HGHS), receiver functionality provides improved situational awareness through non-cooperative detection and ID of all airborne platforms, beyond radar horizon and overland passive surveillance supporting all mission areas, provides extended Nulka queuing ranges. Additional improvements (e.g., initial Network-Centric Warfare Electronic Support (NCWES) interfaces) and upgraded software and displays provide integration of capabilities.

Block 1C will incorporate Block 1A and 1B upgrades for active ships (CVN, CG, LHD, LHA, DDG 68-83) and two-way connectivity to Global Command Control System-Maritime netting all Electronic Warfare assets, both local and national.

Status
SEWIP was established as an ACAT II program in July 2002 as a replacement of the cancelled Advanced Integrated Electronic Warfare System (AIEWS). Acquisition Decision Memorandum (ADM) of 13 August 2002 authorized the SEWIP to proceed with Block 1A and initiate development of Blocks 1B and 1C. Block 1A Stand-Alone ESE reached at Milestone C/ LRIP decision on 31 January 2005. ICAD/UYQ-70 LRIP is currently planned for the first quarter of FY 2006, and Block 1A full-rate production is planned for FY 2006. Block 1B1, SSX-1, has been authorized as a Rapid Deployment Capability (RDC) for fielding stand-alone SEI capability. Development efforts of Blocks 1B2 and 1B3 are progressing toward FY 2007 TECHEVAL/OPEVAL.

Developers
Northrop Grumman PRB Systems; Goleta, California
Lockheed Martin; Eagan, Minnesota
General Dynamics Advanced Information Systems; Fairfax, Virginia

Surface Ship Torpedo Defense (SSTD)

Description
The SSTD project consists of the WSQ-11 Torpedo Defense System, the SLQ-25A Nixie towed torpedo countermeasure, and expendable acoustic decoys. The purpose of these systems is to provide underwater torpedo protection for all major surface ship types to include aircraft carriers, surface combatants, logistics ships, and military sealift command (MSC) ships.

The WSQ-11 Torpedo Defense System includes the functionality of the Nixie countermeasure as well as a towed Detection, Classification, and Localization (DCL) subsystem, and a hard kill Anti-Torpedo Torpedo (ATT). The DCL component consists of a towed, active/passive sonar to include a high power transmission source and an acoustic intercept receiver. The DCL array is sized to fit on the existing Nixie handling equipment and use the same deck space and electronics cabinets. The DCL subsystem can trigger an ATT engagement in either automatic or semi-automatic modes, manual ATT launch mode is also available.

The SLQ-25A Nixie is a towed electro-acoustic countermeasure currently in Fleet service. Performance and reliability upgrades have been in progress since 2004 and will continue through 2009. In addition to Nixie, over-the-side deployed Acoustic Decoys are being acquired to provide an effective and low-cost near term solution to the torpedo defense problem.

Status
The SSTD project is on track to meet the near-term objective of concurrently developing and demonstrating the DCL subsystem and the ATT. Contracts have been awarded by NAVSEA to two prime contractors for the purpose of developing two independent DCL systems that will be tested side by side at sea in a late FY 2006 demonstration. This demonstration will include the firing of approximately ten torpedo test vehicles simulating threat torpedoes against each of the two systems to evaluate their effectiveness. The ATT is currently in development at the Penn State University Applied Research Laboratory (ARL) and is undergoing an aggressive testing and development phase with two major in-water test events in FY 2006. The ATT effort and DCL effort will marry up following these demonstrations. The SSTD project is expected to meet a Milestone B acquisition program decision in early FY 2008 with delivery to the fleet by late FY 2012.

Developers
Anti-Torpedo Torpedo: Penn State Applied Research Laboratory; State College Pennsylvania
DCL Systems: Advanced Acoustic Concepts; Long Island, New York
Ultra Electronics; Braintree, Massachusetts
Technical Design Authority: The Naval Undersea Warfare Center; Newport, Rhode Island

Tactical Control System (TCS)

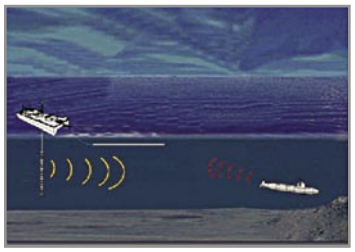
Description
TCS provides interoperability and commonality for mission planning, Command and Control (C2), and C4I interfaces for tactical and medium altitude Unmanned Aircraft Systems (UAS). TCS provides a full range of scaleable UAS capability from passive receipt of air vehicle and payload data to full air vehicle and payload C2. TCS offers the warfighter a common core operating environment to receive, process, and disseminate UAS data from two or more different UAS types for reconnaissance, surveillance, and combat assessment. In conjunction with Fire Scout and Littoral Combat Ship (LCS), TCS is positioned to support Sea Shield/Sea Basing pillars and to operate within the FORCEnet architecture.

Status
TCS restructure was completed in order to comply with FY 2004 congressional language. The program meets congressional direction to achieve standards-based interoperability and support Navy UAS requirements. TCS continues development of an architecture that includes the following capabilities:

- **Standards based implementation.**
- **Incorporation of NATO STANAG 4586 for interoperability**
- **VTUAV (Fire Scout) functionality and integration with LCS.**
  TCS will IOC with Fire Scout and LCS in FY 2008
- **Plug and play capability**

TCS flight-testing was initiated in FY 2003 and continues in conjunction with the Fire Scout Program. TCS will be integrated, tested, and fielded in accordance with the schedules of future Navy UAS programs.

Developers
System Integrator, Raytheon Systems Inc.; Falls Church, Virginia



UQQ-2 SURTASS/Low Frequency Active (LFA)

Description

The LFA system, the active adjunct to the Surveillance Towed Array Sensor System SURTASS sonar system, is capable of long-range detections of submarine and surface ship contacts. It comprises a low-frequency active sonar transmitter deployed below a SURTASS ship, with the SURTASS passive towed array acting as the receiver. Other Navy ships with towed arrays and compatible processing systems can also process the LFA signal returns in what is known as a "bi-static" mode. As a mobile system, SURTASS/LFA can be employed as a force-protection sensor wherever the force commander directs, including in forward operating areas or in support of battle group activities. A UHF SATCOM communication system provides direct voice and data connectivity between the SURTASS/LFA ship and tactical platforms. Two LFA systems exist, installed onboard USNS Impeccable (T-23) and the leased R/V Cory Chouest. Development continues for future LFA-type active systems employing smaller, lighter sources.

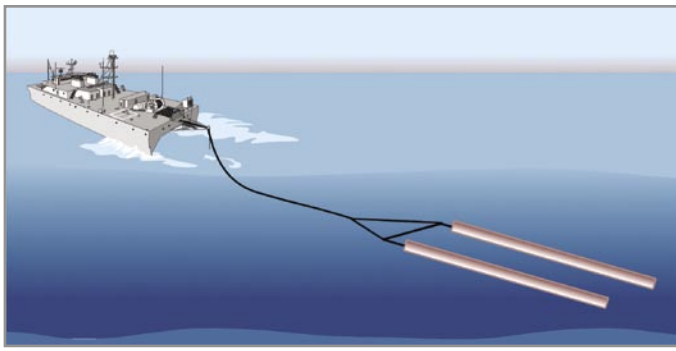
Status

SURTASS LFA was successfully reintroduced to the fleet in January 2003 following a five-year hiatus for completion of the Environmental Impact Statement (EIS) process. In October 2003 a Federal District Court enjoined testing and training with LFA for violation of the procedural requirements of the Marine Mammal Protection Act, Endangered Species Act, and National Environmental Policy Act, notwithstanding the court's finding that a national security need existed for employment of LFA and commended the Navy for the breadth of scientific research supporting the EIS. Subject to this injunction, LFA may conduct operations in certain areas within the Philippine Sea, East China Sea, South China Sea, and the Sea of Japan. The Navy released a Draft Supplemental Environmental Impact Statement (DSEIS) in the first quarter of FY2006. This DSEIS will address legislative changes to the Marine Mammal Protection Act and pertinent deficiencies raised by the District Court. The final SEIS is scheduled to be released in the third quarter of FY 2006. Currently the program consists of the USNS *Impeccable* (T-23) and one leased vessel R/V Cory Chouest.

Developers

General Dynamics Advanced Information Systems;
Anaheim Hills, California
BAE Systems; Manchester, New Hampshire
Alpha Marine; Galliano, Louisiana
Lockheed Martin Naval Electronics & Surveillance Systems;
Manassas, Virginia and Syracuse, New York

UQQ-2 Surveillance Towed Array Sensor System (SURTASS)



Description

The SURTASS capability consists of a mobile fleet of five ships that employ the fleet's most capable deep and shallow water (littoral zone) passive-acoustic towed-array sonar systems. These ships provide passive detection of quiet nuclear and diesel submarines and real-time reporting of surveillance information to theater commanders and operational units. SURTASS employs either a long-line passive-sonar acoustic array or a shorter twinline passive-sonar acoustic array. The twin-line system is the best operational shallow water towed array and the only multi-line towed array in the Navy. It consists of a pair of arrays towed side-by- side from a SURTASS ship and offers significant advantages for undersea surveillance operations in the littoral zone. It can be towed in water as shallow as 180 feet, provides significant directional noise rejection, offers bearing ambiguity solution without turning, allows the ship to tow at higher speed, and results in a shorter time to stabilize the array after a turn.

Status

Five SURTASS vessels are operational in the Pacific Fleet. The first production model TB-29A twin-line SURTASS array was installed in FY 2005, and four SURTASS vessels will have TB-29A twin line arrays by FY 2007. SURTASS is also being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in Logistics Support and Software Maintenance.

Developers

Lockheed Martin; Syracuse, New York
Lockheed Martin; Manassas, Virginia
BAE Systems; Manchester, New Hampshire
General Dynamics Advanced Information Systems;
Anaheim Hills, California
Alpha Marine; Galliano, Louisiana

S-Band Volume Search Radar (VSR)

Description

The Volume Search Radar (VSR) is an S-band active phased array radar designed to meet all above-horizon detection and tracking requirements for the 21st Century ships without area air-defense missions, specifically DD(X) and CVN 21. VSR will provide long-range situational awareness with above-horizon detection and air control (marshalling) functionality, replacing the functionality of today's SPS-48E and SPS-49 radars. A non-rotating phased array, VSR provides the required track revisit times to deal with fast, low/small, and high-diving missile threats, providing cueing for the SPY-3 Multi-Function Radar (MFR) to conduct required tracking and fire control functions above the horizon.

Status

Engineering and Manufacturing Development unit build is underway for development, testing, and follow-on production of VSR to support equipment delivery schedules for DD(X) and CVN 21. VSR will be fielded as an integrated radar with the SPY-3 MFR, together referred to as the Dual-Band Radar Suite (DBRS). The VSR Engineering Development Model will be tested at Wallops Island Test Facility in FY 2006. OPEVAL will occur with DD(X) testing. IOC for the DBRS is expected to be 2013.

Developers

Northrop Grumman Ship Systems (Prime);
Pascagoula, Mississippi
Raytheon Electronic Systems (Subcontractor-VSR);
Sudbury, Massachusetts
Lockheed-Martin Maritime Sensors & Systems
(Subcontractor to Raytheon-VSR Antenna System);
Moorestown, New Jersey